Health Consultation

Noble Metals

Seattle, King County, Washington

January 7, 2000

Prepared by
The Washington State Department of Health
Under a Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Washington State Department of Health

FOREWORD

The Washington State Department of Health (DOH) has prepared this Health Consultation in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the U.S. Department of Health and Human Services and is the principal federal public health agency responsible for health issues related to hazardous waste. This Health Consultation was prepared in accordance with methodologies and guidelines developed by ATSDR.

The purpose of this Health Consultation is to identify and prevent harmful human health effects resulting from exposure to hazardous substances in the environment. The Health Consultation allows DOH to respond quickly to a request from concerned residents for health information on hazardous substances. It provides advice on specific public health issues. DOH evaluates sampling data collected from a hazardous waste site or industrial site, determines whether exposures have occurred or could occur, reports any potential harmful effects, and recommends actions to protect public health.

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BACKGROUND AND STATEMENT OF ISSUES

This health consultation was prepared at the request of the Washington State Department of Ecology (Ecology) to evaluate the potential health hazard posed by lead in soil at homes adjacent to the Noble Metals site located in Seattle, King County, Washington. DOH prepares health consultations under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR).

The Noble Metals site is located at 928 NW Leary Way (Figure 1). The maximum lead concentration found in on-site soil was 3,130 parts per million (ppm). Contaminated soils were removed from the site in June 1999. Analysis of soil samples taken after excavation confirmed that lead levels were below Ecology's residential cleanup standard of 250 ppm.[1] The site is bordered to the north by two residential properties from which eight surface soil samples were taken at a depth of 0-1 foot, six of which were analyzed for lead (Figure 2). No soil samples were taken from a vegetable garden located on one of the residential properties. Discussions with the Ecology site manager indicate that no children are currently living at either residence. Concentrations of lead in these samples ranged from 170 to 330 ppm.[2]

The distribution of lead in these soil samples indicates that sources other than the Noble Metals site may be contributing to the lead detected on these properties. The sample containing the highest lead level detected in off-site soil is also the furthest from the site. In addition, other hazardous waste sites are present in the vicinity. Current data are not sufficient to determine the likely source(s) of contamination. Ecology is considering an evaluation of background soil lead levels in the immediate area around the Noble Metals site.

Table 1 below gives the lead concentrations of each off-site soil sample along with an estimated background lead level for Puget Sound soils. There are no ATSDR comparison values available for lead in soil. However, the average soil concentration is exceeds both regional background level of 24 ppm and the residential soil cleanup level of 250 ppm.[1,3]

Table 1. Lead in surface soils at residential properties near the Noble Metals site.

Sample	Lead Concentration (ppm)
HC-BO1	230
HC-BO2	170
HC-BO3	NA
HC-BO4	NA
HC-BO5	210
HC-BO6	270
HC-BO7	310
HC-BO8	330

Sample	Lead Concentration (ppm)
Average	280

NA = not analyzed.

DISCUSSION

The soil sampling data collected from two residences adjacent to the site show elevated lead concentrations when compared with average background levels found in the Puget Sound area. As a worst-case scenario, the following evaluation assumed that the soil is available for contact by children six years of age or less. It is understood that no children currently reside on the property. However, childhood exposure was evaluated in order to assess the potential for future exposures.

Lead occurs naturally in very small amounts throughout the environment. The use of lead compounds in gasoline, batteries, pipes, ammunition and paint has contributed to the widespread dispersion of lead in air, soil, and water. Levels of lead in air have decreased significantly in the United States in accordance with the reduction and ultimate elimination of leaded gasoline use. A major exposure pathway of concern is the ingestion and inhalation of indoor house dust contaminated with lead from chipping and peeling paint. Lead in drinking water that leaches from solder in old plumbing has also been identified as a pathway of concern.[4]

Lead Exposure and Children

Children below six years of age are thought to be the most susceptible to both exposure and toxicity of lead. The most sensitive toxic effect from lead exposure in children involves behavioral changes resulting from nervous system toxicity. Many of these behavioral changes involve impaired learning ability including decreased performance on IQ tests. These changes have been measured at very low levels of lead in the blood. Evidence exists to indicate that health effects in young children may occur at blood lead levels as low as 6 micrograms per deciliter (ug/dl). ATSDR considers a blood lead level of 10 ug/dl or greater as an indication of excessive lead exposure.[3]

Based on available off-site soil sampling data, EPA's Integrated Exposure Uptake Biokinetic (IEUBK) model estimates an average blood lead level of 5.0 ug/dl for children between one and two years of age. Children within this age range are thought to be the most susceptible to blood lead increases resulting from exposure to contaminated soil.[5] However, sampling of the impacted residences is limited and does not include a vegetable garden that borders the site. The garden represents the most likely exposure point for direct contact with soil (i.e. incidental ingestion).

Although the IEUBK model includes default background assumptions for all routes of exposure,

recent evidence suggests that exposure from ingestion of root vegetables may be higher than assumed. Most vegetables are not expected to absorb lead from soil to any significant extent. However, recent evidence indicates that carrots can uptake lead in some circumstances. Carrots grown on a former Washington apple orchard that had received historical lead arsenate application contained elevated levels of lead.[6] Lead concentrations ranged from 18 to 490 ppm in soil and 1 to 3 ppm in the carrots.[7] The factors that contributed to this surprising result are not well understood at this time. It is known that lead is more available for uptake in plants grown in acidic soil (e.g. pH < 6.5). The presence of organic material in the soil is known to bind metals making them less available for uptake.[8,9] Although it is not possible to predict how much lead exposure might result from eating carrots grown in this garden, the recent data cited above suggest that this pathway could contribute significantly to overall lead exposure.

The limited soil sampling at adjacent residences to the Noble Metals site indicates that lead exposure via direct contact with soil will not result in any adverse health effects for current and future residents. However, no soil sampling data is available for the garden located adjacent to the site. This garden represents a high exposure area for residents via direct contact with soil and ingestion of vegetables. Soil samples from the garden are necessary to properly evaluate overall exposure to lead at residences adjacent to the Nobel Metals site.

CONCLUSION

An indeterminate public health hazard exists for residents exposed to lead in soil at properties adjacent to the Noble Metals site. Residents could be exposed to lead in soil via direct contact or ingestion of home-grown vegetables. Although limited sampling indicates that lead in soil does not pose an apparent public health hazard, sampling of garden soil is necessary to ensure a proper evaluation of overall lead exposure for residents living at these homes.

RECOMMENDATIONS

Soil samples should be taken in the garden adjacent to the Nobel Metals site. Analysis of these samples should include lead, pH and organic carbon content.

Pending more soil sampling data, the following recommendations should be considered for residents living in these homes.

- Wash leaf vegetables and peel root vegetables grown at these residences to remove adhering soil.

- Maintain a high soil organic content and pH greater than 6.5 in garden soil to reduce the potential for lead uptake in vegetables.

- Children living at these residences should avoid contact with garden soil

PREPARER OF REPORT

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REFERENCES

1. Washington State Department of Ecology. Model Toxics Control Act Cleanup Regulation. Chapter 173-340 WAC. Amended January 1996. Publication No. 94-06.

2. Hart Crowser Inc. Report of Independent Action Former Noble Metals Site Seattle, Washington. Prepared Johannessen & Associates, P.S., and Millican of Washington, Inc. September 16, 1999.

3. Washington State Department of Ecology. Natural Background Soil Metals Concentrations in Washington State. October 1994. Publication No. 94-115.

4. Agency for Toxic Substances and Disease Registry. Draft Toxicological Profile for Lead. August 1997.

5. Environmental Protection Agency. March 8, 1994. Uptake Biokinetic Model for Lead. Version 0.99D.

6. Washington State Department of Agriculture. News Release: Group working to prevent crop plantings in high lead soil. January 29, 1999.

7. Washington State Department of Health. Files: Noble Metals Site.

8. Rosen C.J. and Munter R.C. Lead in Home Garden and Urban Soil Environment. University of Minnesota 1998. Available at Internet: http://www.extension.umn.edu/distribution/horticulture/DG2543.html.

9. Peyrea F.J. Gardening on Lead- and Arsenic-Contaminated Soils. Washington State University. 1999. Available at Internet: http://www.cahe.wsu.edu/infopub/eb1884/eb1884.htm

Glossary

Agency for Toxic Substances and Disease Registry (ATSDR)	The principal federal pubic health agency involved with hazardous waste issues, responsible for preventing or reducing the harmful effects of exposure to hazardous substances on human health and quality of life. ATSDR is part of the U.S. Department of Health and Human Services.
Contaminant	Any chemical that exists in the environment or living organisms that is not normally found there.
Dose	A dose is the amount of a substance that gets into the body through ingestion, skin absorption or inhalation. It is calculated per kilogram of body weight per day.
Exposure	Contact with a chemical by swallowing, by breathing, or by direct contact (such as through the skin or eyes). Exposure may be short term (acute) or long term (chronic).
Hazardous substance	Any material that poses a threat to public health and/or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive.
Indeterminate public health hazard	Sites for which no conclusions about public health hazard can be made because data are lacking.
Model Toxics Control Act (MTCA)	The hazardous waste cleanup law for Washington State.
No apparent public health hazard	Sites where human exposure to contaminated media is occurring or has occurred in the past, but the exposure is below a level of health hazard.
Parts per million (ppm)	Units commonly used to express low concentrations of contaminants. For example, 1 ounce of lead in 1 million ounces of soil is 1 ppm. Also referred to in units of milligrams of contaminant per kilograms of soil (mg/kg).
Route of exposure	The way in which a person my contact a chemical substance that includes ingestion, skin contact and breathing.

Appendix: Figures

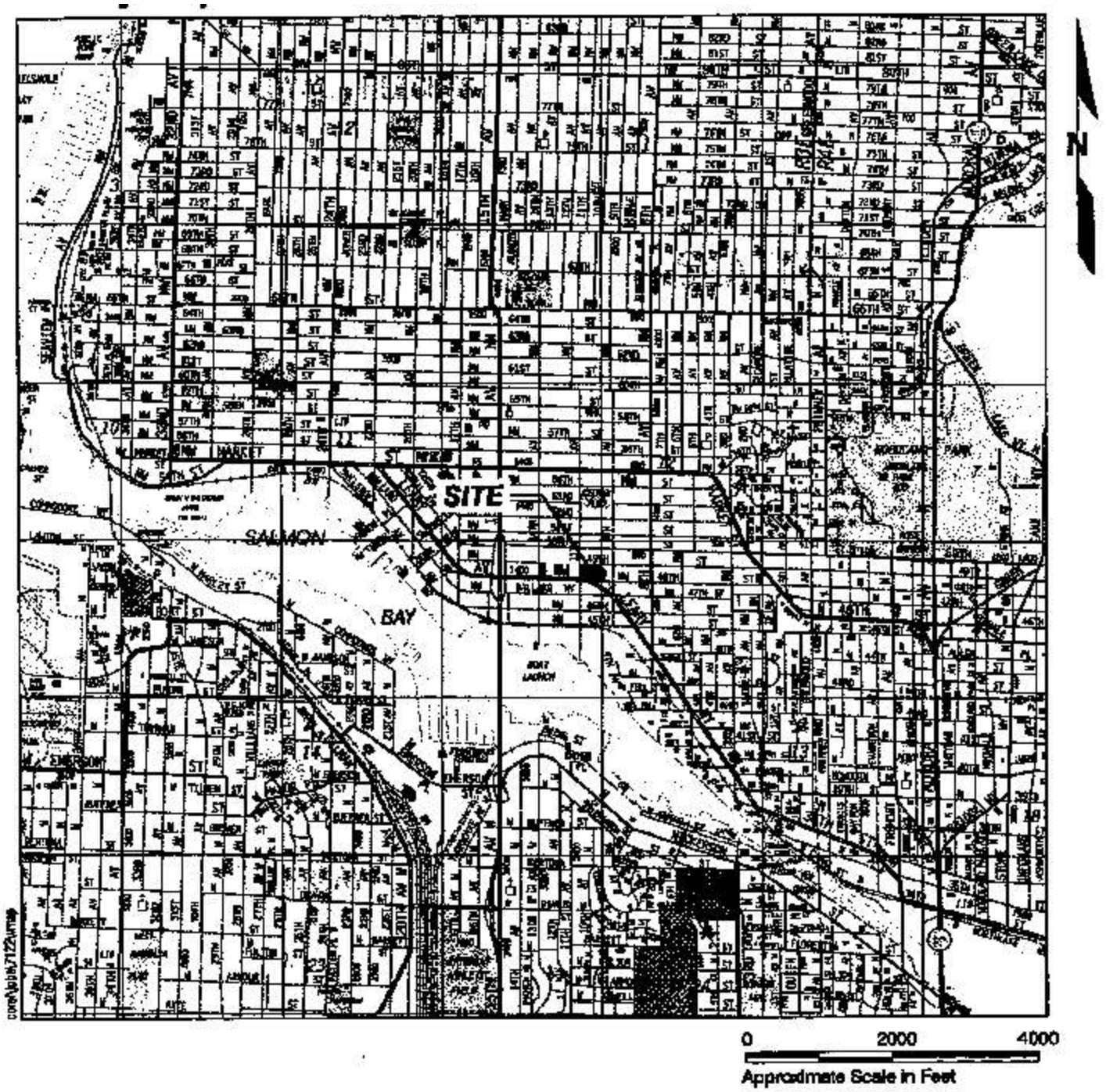

Figure 1. Site location map for the Noble Metals site, Seattle, Washington (adapted from Ref. 1).

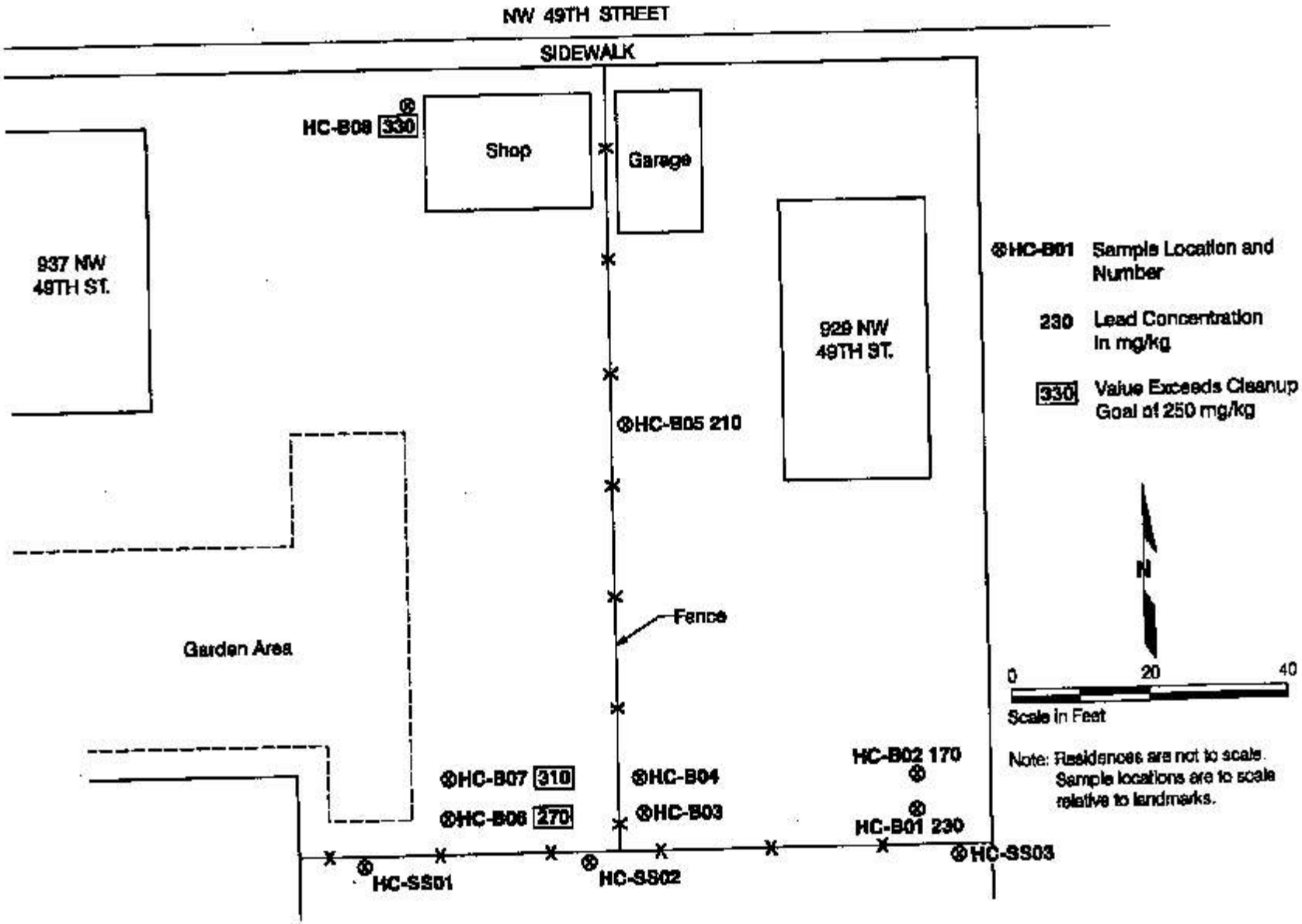

Figure 2. Diagram of off-site surface soil sampling locations near the Nobel Metals site, Seattle, Washington (adapted from Ref. 1). **NOTE:** Three on-site surface soils samples HC-SS01, HC-SS02 and HC-SS03 contained lead at 190, 1,100 and 470 mg/kg. Off-site samples HC-B03 and HC-B04 were not analyzed for lead. Units of mg/kg are equivalent to ppm.